CLAIMS

1. An analysing method with a view to sorting products such as pieces of fruit which are transported along an axis (x) on a conveyer line having a plurality of rollers (3, 4) which are mounted so as to each rotate freely about a transverse axis of rotation orthogonal to the axis (x), and which are spaced apart in such a way that two adjoining rollers (3, 4) define, between them, a seating for a product, the said analysing method consisting in using analysing means which are split up into a number of successive stations (5, 6, 7) arranged at a distance from one another along the axis (x), and in causing the rollers (3, 4) to revolve about their axes of rotation between the stations (5, 6, 7) in such a way as to display, at each of the said stations, different faces of each product, wherein:

- three analysing stations (5-7) are arranged along the conveyer line, and each of the said analysing stations is equipped with at least one camera (8, 9, 12, 14) which is orientated and adapted to make, with an adjustable frequency, photographs of the products transported by the conveyer line,

. one of the said stations (5) having two cameras (8, 9) which are arranged on either side of the conveyer line in the same vertical plane orthogonal to the axis (x), and are orientated in such a way that their respective optical axes form a V which is centred on the said axis (x) and has a vertex angle substantially in the range between 90° and 130°,

. the other two stations (6, 7) each comprising a camera (12, 14) which is arranged plumb with the conveyer line and is orientated in such a way that its optical axis is vertical and secant with the axis (x),

- in a preliminary phase, there are determined the average diameter of the products to be analysed and, as a function of the said average diameter, a speed of rotation of the rollers (3, 4) which is adapted so that a product of average diameter which is located in the plane of a camera (8, 9) at the first station (5) and is caused to revolve on itself along the whole of the analysing means under the effect of the rotation of the said rollers, undergoes a rotation such that four complementary zones on its surface are viewed by the respective cameras (8, 9, 12, 14) of the first, second and third stations (5-7),

- and during the conveying of the products, the rollers (3, 4) are caused to revolve continuously at the predetermined speed of rotation, and for each product:

. mi photographs of this product are made at the first station (5), where $i \geq 3$, nj photographs at the second station (6), where $j \geq 1$, and pk photographs at the third station (7), where $k \geq 3$,

. the theoretical diameter of the product is calculated from the photographs made,

. and the photographs mi, nj and pk to be taken into account with a view to analysing the said product are determined by comparison of the theoretical diameter of the said product with the predetermined average diameter, in such a way as to obtain a complete analysis, without overlapping or with a given overlap, of the total surface of the said product.

2. An analysing method as claimed in claim 1, wherein a speed of rotation of the rollers (3, 4) is determined which is adapted so that a product of average diameter undergoes a rotation on itself with an angle of rotation substantially in the range between 110° and 130° between the first and

second stations (5, 6), and with an angle of rotation substantially in the range between 105° and 115° between the second and third stations (6, 7).

3. An analysing method as claimed in claim 2, wherein the stations (5-7) of analysing means are arranged in such a way that the distance between the first and second stations (5, 6) is substantially in the range between 1.1 and 1.2 times the distance between the second and third stations (6, 7), and the rollers (3, 4) are caused to revolve in rotation at a constant speed of rotation along the whole of the said analysing device.

4. An analysing method as claimed in one of claims 2 or 3, wherein a speed of rotation of the rollers (3, 4) is determined which is adapted so that a product of average diameter undergoes a rotation on itself with an angle of rotation substantially equal to 125.5° between the first and second stations (5, 6), and with an angle of rotation substantially equal to 109° between the second and third stations (6, 7).

5. An analysing method as claimed in one of claims 2 to 4, wherein the distance between the first and second stations (5, 6) is substantially equal to 1.15 times the distance between the second and third stations (6, 7).

6. An analysing method as claimed in one of claims 2 to 5, wherein the cameras (8, 9) of the station (5) comprising two cameras are arranged in such a way that their respective optical axes define a V with a vertex angle substantially equal to 109°.

7. An analysing method as claimed in one of the preceding claims, wherein the first station (5) is equipped with two cameras (8, 9), and the second and third stations (6, 7) with one camera (12, 14).

8. An analysing method as claimed in one of the preceding claims, wherein three photographs of each product are taken at the first and third stations (5, 7), and a single photograph of the said products at the second station (6).

9. An analysing device with a view to the automatic sorting of products such as pieces of fruit, the said device comprising:

. a conveyer line for transporting the products along a longitudinal axis (x), the said line having a plurality of rollers (3, 4) which are mounted so as to each rotate freely about a transverse axis of rotation orthogonal to the axis (x) and are spaced apart in such a way that two adjoining rollers (3, 4) define, between them, a seating for a product,

. means for analysing the surface of the products, which means are arranged above the conveyer line and have a number of successive stations (5-7) arranged at a distance from one another along the axis (x),

. means (20) for driving the rollers (3, 4) in rotation about their axes of rotation, which means are suitable for bringing about rotation of the said rollers between the analysing stations (5-7) in such a way that different faces of the products are analysed at each station,

. and a processing unit adapted to receive information emanating from the analysing means, and to calculate workable sorting data from predefined, programmed criteria,

wherein:

. the analysing means comprise three analysing stations, each of the said analysing stations (5-7) having at least one camera (8, 9, 12, 14) which is orientated and adapted to

make, with an adjustable frequency, photographs of the products transported by the conveyer line,

. one of the said stations (5) having two cameras (8, 9) which are arranged on either side of the conveyer line in the same vertical plane orthogonal to the axis (x), and are orientated in such a way that their respective optical axes form a V which is centred on the said axis (x) and has a vertex angle substantially in the range between 90° and 130°,

. the other two stations (6, 7) each comprising a camera (12, 14) which is arranged plumb with the conveyer line and is orientated in such a way that its optical axis is vertical and secant with the axis (x),

. the means (20) for driving the rollers (3, 4) in rotation are arranged in such a way as to bring about continuous rotation of the said rollers along the analysing means, at a speed of rotation which is adapted so that a product of predetermined average diameter which is located in the plane of a camera (8, 9) at the first station (5) and is caused to revolve on itself along the whole of the analysing means under the effect of the rotation of the said rollers, undergoes a rotation such that four complementary zones of its surface are viewed by the respective cameras (8, 9, 12, 14) of the first, second and third stations (5-7),

. the processing unit is adapted to:

. process, for each product, mi photographs of the said products taken at the first station (5), where $i \geq 3$, nj photographs taken at the second station (6), where $j \geq 1$, and pk photographs taken at the third station (7), where $k \geq 3$,

. and to determine, by a comparison of the theoretical

diameter of this product with the predetermined average diameter, the mi, nj and pk photographs to be taken into account with a view to analysing the said product, in such a way as to obtain a complete analysis, without overlapping or with a given overlap, of the total surface of the said product.

10. An analysing device as claimed in claim 9, wherein the first station (5) has two cameras (8, 9), the second and third stations (6, 7) having a single camera (12, 14).

11. An analysing device as claimed in one of claims 9 or 10, wherein the distance between the first and second stations (5, 6) is substantially in the range between 1.1 and 1.2 times the distance between the second and third stations (6, 7).

12. An analysing devices as claimed in claim 11, wherein the distance between the first and second stations (5, 6) is substantially equal to 1.15 times the distance between the second and third stations (6, 7).

13. An analysing device as claimed in one of claims 9 to 12, wherein the cameras (8, 9) of the station (5) comprising two cameras are advantageously orientated in such a way that their respective optical axes define a V with a vertex angle substantially equal to 109°.

14. An analysing device as claimed in one of claims 9 to 13, wherein the means for driving the rollers (3, 4) in rotation comprise an endless belt (20) extending, underneath the conveyer line, along the analysing means, and arranged in such a way as to be tangential to the lower generatrix of the said rollers, and means for driving the said endless belt which are suitable for causing the latter to run at a regulable running speed which is different from that of the conveyer line.

15. An analysing device as claimed in claim 14, wherein the means for driving the endless belt (20) are adapted to drive it in the same direction of displacement as that of the conveyer line at an adjustable running speed which is lower than that of the said conveyer line.